



Australian Government

MARL6011A Demonstrate intermediate knowledge of marine auxiliary boilers

Release 1

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Modification History

Release 1

This is the first release of this unit.

Unit Descriptor

This unit involves the skills and knowledge required to operate and maintain marine auxiliary boilers on a commercial vessel. This includes analysing the responsibilities of an Engineer Class 2 in relation to auxiliary boiler and steam plant of a vessel, design of marine auxiliary boilers, operation of thermal fluid heating plants, layout of marine stem systems and components, and procedures for inspecting marine auxiliary boilers and associated plant.

Application of the Unit

This unit applies to the work of a Marine Engineer Class 2 on commercial vessels greater than 3000 kW and forms part of the requirements for the Certificate of Competency Marine Engineer Class 2 issued by the Australian Maritime Safety Authority (AMSA).

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1 Outline responsibilities of an Engineer Class 2 in relation to auxiliary boiler and steam plant of a vessel	1.1	Commonwealth, state/territory and local legislation and regulations that relate to marine boilers and steam plant in terms of safety, repairs and pollution, including implementation, is identified
	1.2	Safe operating practices for all steam plant are examined and standing orders as to their operation are prepared or modified
	1.3	Procedure for establishing engine room staff who are fully conversant with safe practices for boiler operation is outlined
2 Evaluate design and construction of marine auxiliary boilers	2.1	Typical boiler types illustrating cross section, attachments and location of all fittings, mountings, scantlings and method of achieving circulation are examined
	2.2	Material requirements for boiler components are identified
	2.3	Construction of different types of boilers is analysed
	2.4	Different gauge glass types are compared
3 Evaluate design and operation of thermal fluid heating plants	3.1	Typical thermal fluid heating plant is explained and advantages and limitations of the system are identified
	3.2	Locations and functions of all fittings and safety devices in a typical thermal fluid system are explained
	3.3	Properties of thermal fluid, effects of contamination and methods of testing fluid are analysed
	3.4	Thermal fluid heating is compared to conventional steam plant
4 Evaluate layout and design of marine steam systems and components	4.1	Typical steam system layout showing location of all components on feed and heating side is detailed
	4.2	Material requirements for steam system components are identified
	4.3	Reasons for operating plant and systems at nominated temperatures and pressures, and effects of departing from these parameters are explained
	4.4	Symptoms of faults in steam traps, hot wells, de-aerators, condensers, evaporators and requirements for contamination prevention between systems, are analysed
5 Outline procedure for inspecting marine auxiliary	5.1	Procedure for shutting down, isolating and opening up a boiler for inspection or during an emergency is clarified
	5.2	Possible defects that may occur in a boiler, fire and water side, their

boilers and associated plant	location and effects are analysed
	5.3 Repair procedures commonly employed for damaged boilers are examined and limitations of such repairs are explained
	5.4 Procedures for leak detecting in boilers and steam equipment are clarified and remedial actions are explained
	5.5 Mechanism of economiser fires are analysed
	5.6 Procedure for detecting economiser fires, actions for controlling after occurrence and preventative measures are clarified
6 Differentiate between safety valves types	6.1 Common types of boiler safety valves are analysed and sketched, and how they are classified in terms of valve lift is explained
	6.2 Materials used in safety valves are identified and operational problems that can occur are analysed
	6.3 Procedure for setting valve lift pressure is established and precautions necessary when testing valve on fired and non-fired boilers are examined
	6.4 Defects that may be found when dismantling a safety valve for survey are analysed
7 Evaluate problems associated with feed and boiler water	7.1 Causes of scaling and corrosion of water side of a boiler and how these can be minimised are analysed
	7.2 Acceptable operational range and effects of contamination on boiler chemical reserves are identified
	7.3 Reliability of boiler water test results are analysed in relation to sampling procedure, testing equipment and shelving of test chemicals
	7.4 Different tests carried out on boiler water are explained and implications of out-of-range results are interpreted
	7.5 Use of different chemicals to treat and condition boiler water is assessed
	7.6 Procedure to be adopted when boiler is severely contaminated from different sources is outlined
8 Evaluate marine fuel systems	8.1 Boiler fuel system, its components and maintenance procedure are detailed
	8.2 Combustion process, its monitoring system and requirements for good combustion are analysed

- 8.3 Different types of burners are compared and contrasted and how atomisation is achieved is explained
- 8.4 Operation of a burner management system that incorporates pressure and level control is explained
- 8.5 Protection devices, alarms and shut downs, found on firing system are identified and their method of operation is analysed

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required Skills:

- Access information related to marine auxiliary boilers
- Assess own work outcomes and maintain knowledge of current codes, standards, regulations and industry practices
- Explain intermediate operation of marine auxiliary boilers
- Identify and apply relevant solutions for addressing problems associated with marine auxiliary boilers
- Identify and interpret diagnostic information, and perform mathematical calculations related to operating, maintaining and repairing marine auxiliary boilers
- Identify methods, procedures and materials needed for operating, maintaining and repairing marine auxiliary boilers
- Impart knowledge and ideas through verbal, written and visual means
- Read and interpret manuals, technical specifications, safety data sheets/material safety data sheets and manufacturer guides related to operating, maintaining and repairing marine auxiliary boilers

Required Knowledge:

- Basic principles of operation of boilers and steam systems
- Combustion in boilers and related safety procedures, including importance of purging a boiler and other safety precautions taken when firing a boiler
- Common boiler defects and repair procedures
- Fittings mounted on boilers
- Fuel oil system for an auxiliary boiler
- Hazards associated with running boiler plant
- Marine boiler inspection procedures
- Operating principles relating to steam generation in fired and unfired boilers
- Principles of boiler operation in normal and emergency situations
- Procedures for maintaining water level in boilers
- Purpose of alarms and shut downs in marine boilers
- Safety valves
- Treatment, sampling and testing of feed and boiler water
- Types of auxiliary boilers, and typical operating pressures and temperatures
- Typical feed systems for marine boilers
- Work health and safety (WHS)/occupational health and safety (OHS) legislation, policies and procedures

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, the required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the Elements, Performance Criteria, Required Skills, Required Knowledge and include:

- providing accurate and reliable information
- providing appropriate level of detail in responses.

Context of and specific resources for assessment

Performance is demonstrated consistently over time and in a suitable range of contexts.

Resources for assessment include access to:

- industry-approved marine operations site where intermediate knowledge of marine auxiliary boilers can be demonstrated
- diagrams, specifications and other information related to marine auxiliary boilers
- technical reference library with current publications on basic marine auxiliary boilers
- tools, equipment and personal protective equipment currently used in industry
- relevant regulatory and equipment documentation that impacts on work activities
- range of relevant exercises, case studies and/or other simulated practical and knowledge assessments
- appropriate range of relevant operational situations in the workplace.

In both real and simulated environments, access is required to:

- relevant and appropriate materials and equipment
- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals.

Method of assessment

Practical assessment must occur in an:

- appropriately simulated workplace environment and/or
- appropriate range of situations in the workplace.

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate to this unit:

- direct observation of the candidate demonstrating intermediate knowledge of marine auxiliary boilers

- direct observation of the candidate applying relevant WHS/OHS requirements and work practices.

Guidance information for assessment

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

In all cases where practical assessment is used it should be combined with targeted questioning to assess Required Knowledge.

Assessment processes and techniques must be appropriate to the language and literacy requirements of the work being performed and the capacity of the candidate.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

Marine boilers and steam plant may include:

- Condensors
- Economiser
- Feed pumps
- Fired
- High-pressure
- Low pressure
- Medium pressure
- Steam – steam generators
- Unfired

Unit Sector(s)

Not applicable.

Competency Field

Marine Engineering